2014 Report on the Performance of the Defense Acquisition System

On Contract Incentives

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Improving policies and performance through data analysis

7 April 2015

Approved for public release; distribution unlimited: 14-S-1935, 19 June 2014.

Objective: Use statistical analysis of contract data to understand incentive effectiveness

- **What contract incentives work the best?**
  - **Predetermined, formulaic?**
  - **Award fee?**
  - **Firm fixed price?**
  - **Competition**
  - **Future margin**
- **Are final margins affected by contractor performance?**
- **Are fixed-price contracts better than cost-reimbursement?**

Final margins were not dependent on cost, price, or schedule performance in development!

- **At the median (central tendency), DoD-wide margin is systematically predicted by:**

Exogenous constant	**5.7 %**
Margin change effect	**– 0.9 %**
Size (by schedule)	**+ 1.6 %**
Total predicted margin	**6.4 %**

(N=81)

Other variables (statistically insignificant or spurious):

- Cost growth
- Price growth
- Schedule slips
- Contract type
- Army, Navy, or Air Force
- Quantity change
- Commodity type (9 types)
- Overhead share of costs
- Fixed-cost share of costs
- Time trend
- Size of contract by spend

Issue is not what the final margin is, but that it does not systematically vary by performance!

Regression over 81 MDAP development contracts, 95 percent of which were started in or after 2000. Price and cost growth are adjusted for inflation.

Also, final margins were not dependent on cost, price, or schedule performance in production!

- **At the median (central tendency), DoD-wide margin is systematically predicted by:**

Exogenous constant	**14 %**
Margin change effect	**+ 1 %**
LRIP effect	**– 2 %**
Ship effect	**– 1 %**
Space effect	**– 1 %**
Total predicted margin	**= 11 %**

(N=83)

Other variables (statistically insignificant or spurious):

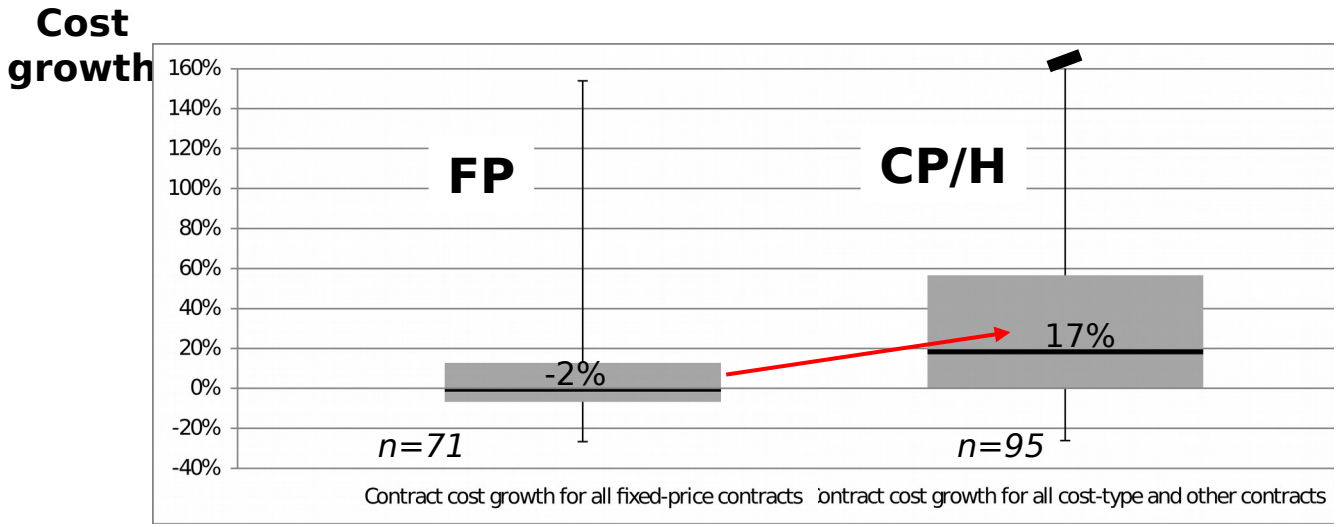
- Cost growth
- Price growth
- Schedule slips
- Contract type
- Service component
- Quantity change
- Other 7 Commodities
- Overhead share of costs
- Fixed-cost share of costs
- Time trend
- Size of contract by schedule
- Size of contract by spend

Issue is not what the final margin is, but that it does not systematically vary by performance!

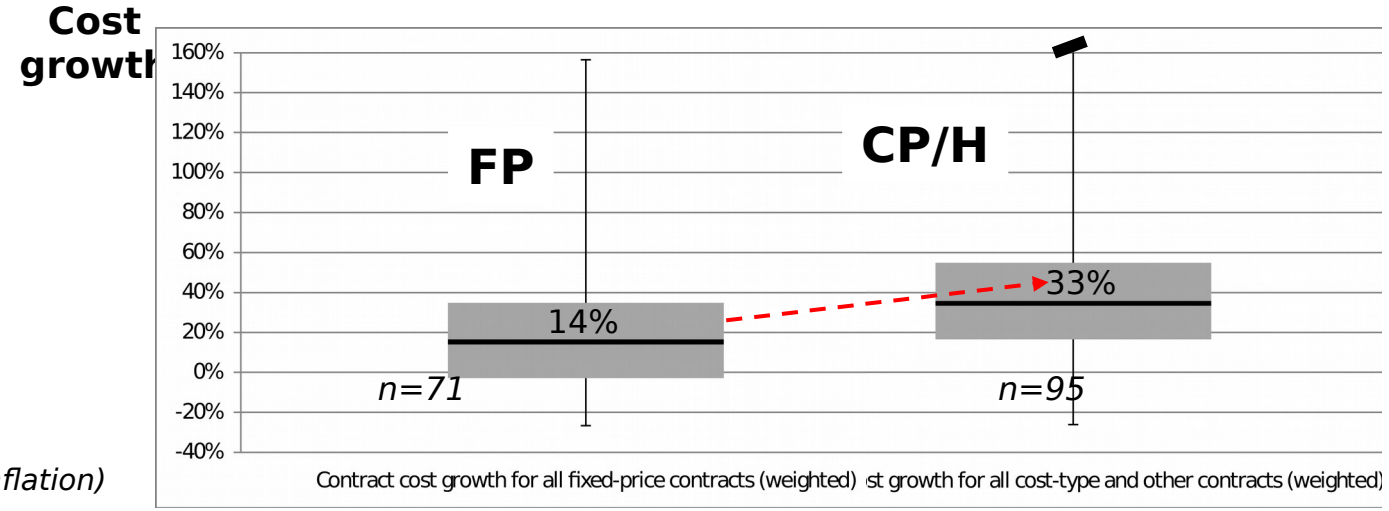
Regression over 81 MDAP development contracts, 95 percent of which were started in or after 2000. Price and cost growth are adjusted for inflation.

Across all phases, fixed-price (FP) contracts had significantly lower cost growth…

Comparison of contract cost growth by contract-type, all contracts



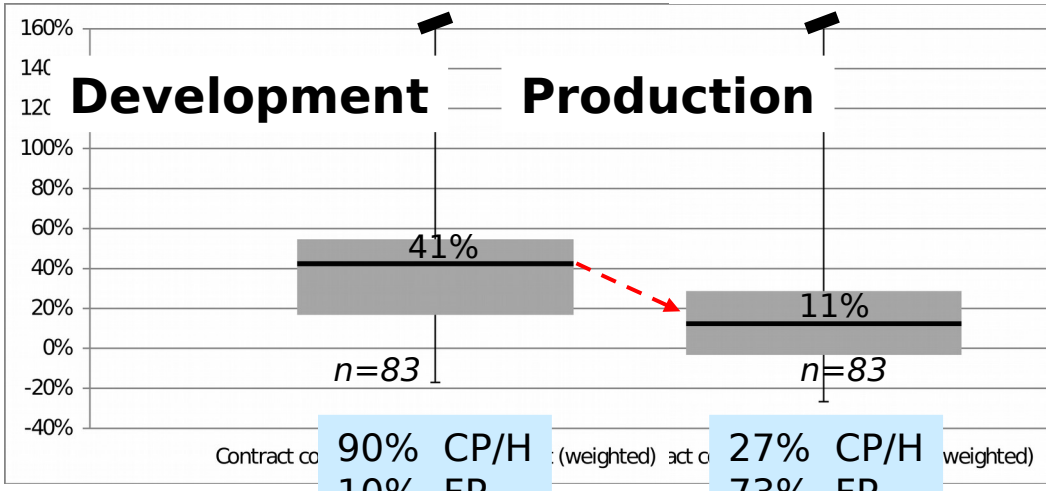
Not weighted

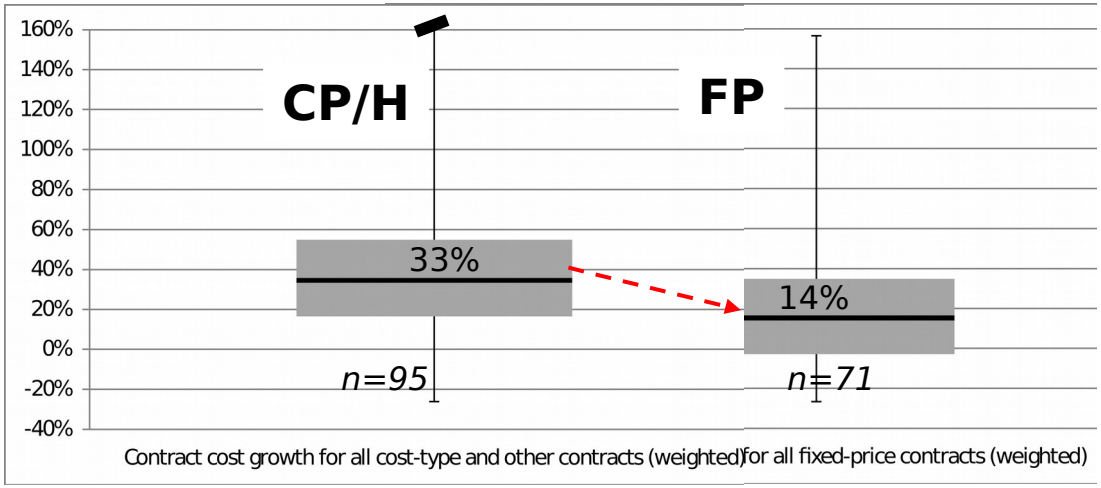


Weighted

(adjusted for inflation)

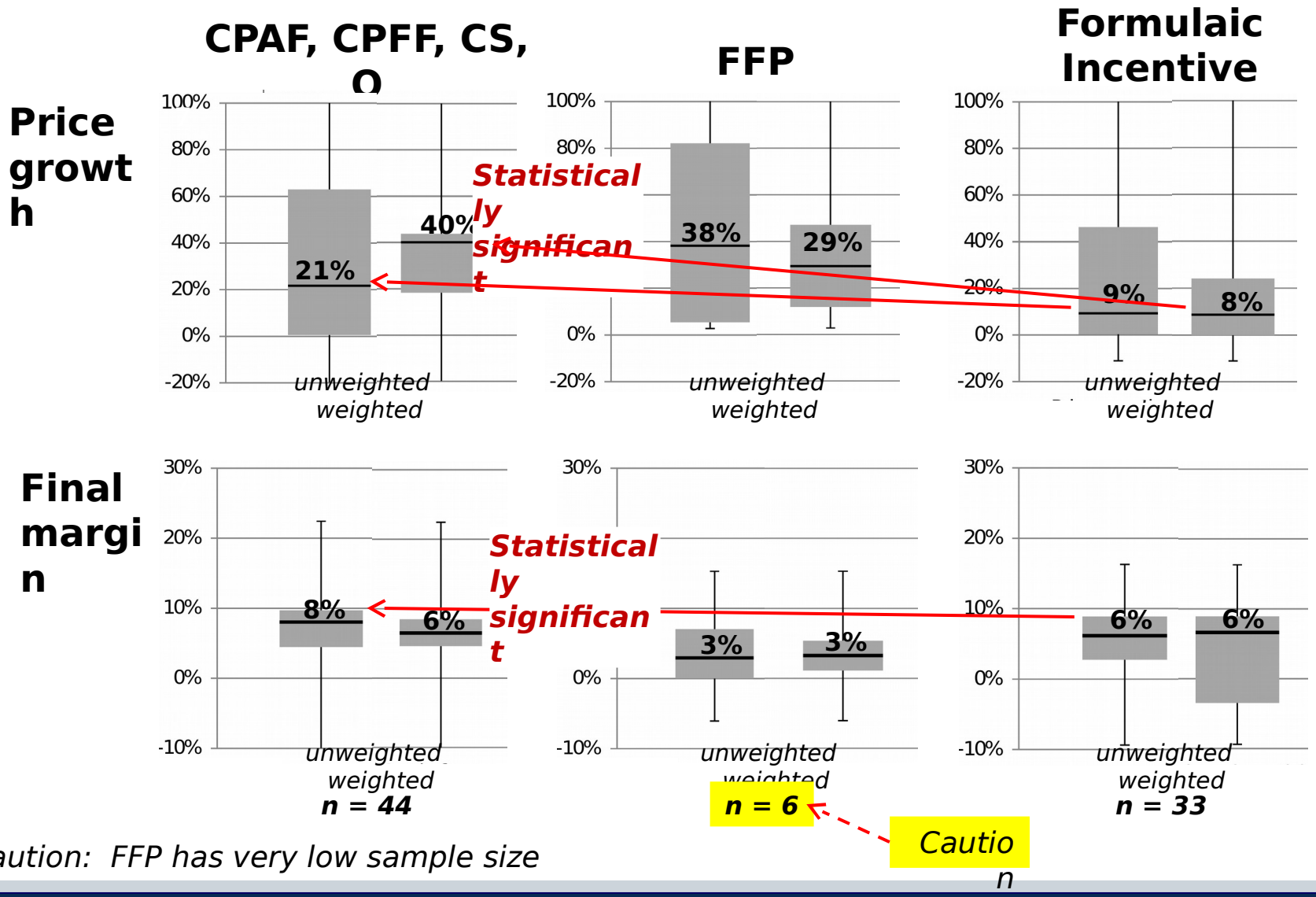
...but this was because FP were used primarily in lower-risk cases (production)





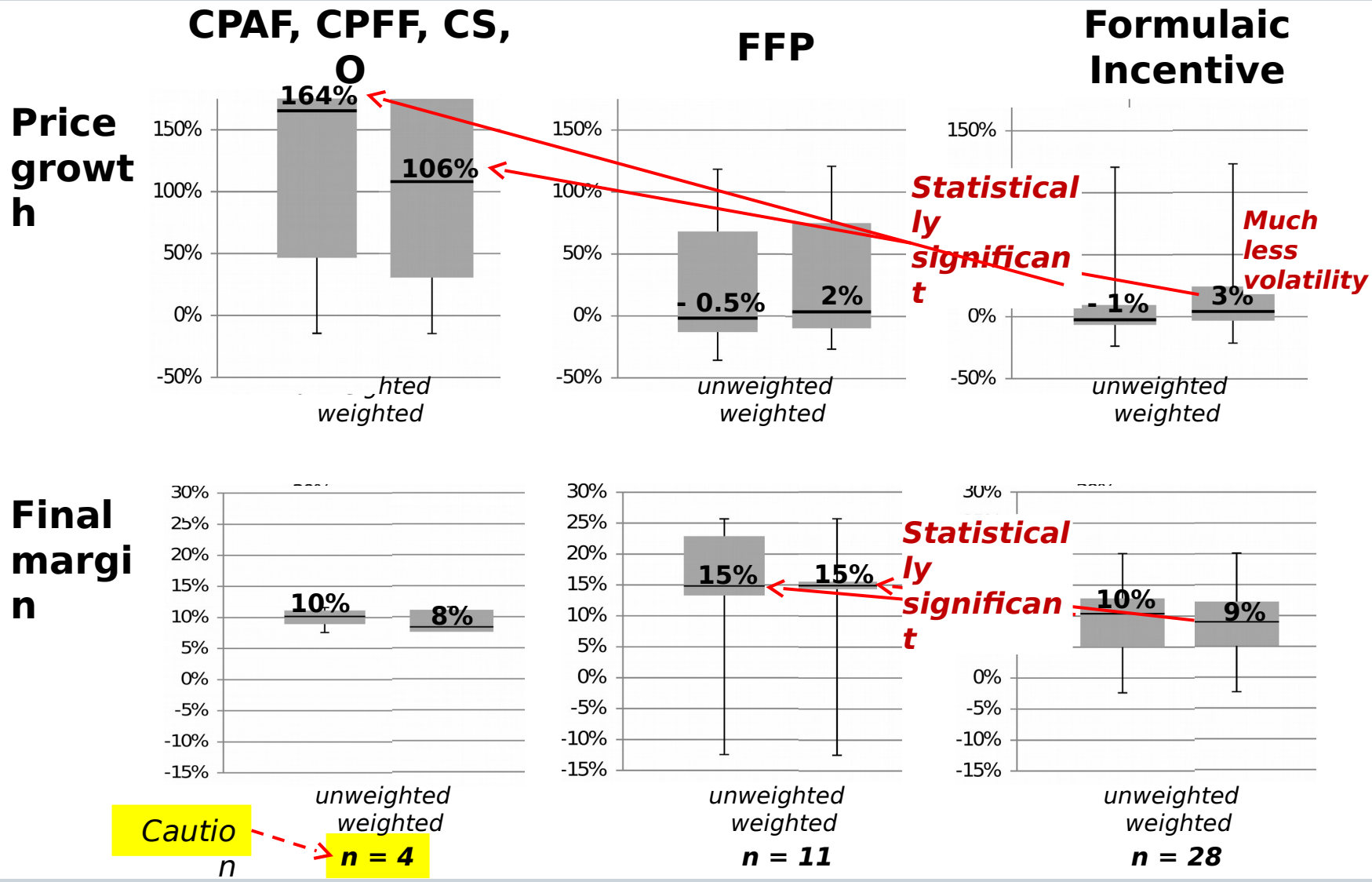
Weighted by spend

In development, CPIF / FPIF perform better than CPAF/FF on equal or lower margins



Caution: FFP has very low sample size

In LRIP, FPIF / CPIF perform as well or better than FFP and have lower margins



In full-rate production, FFPs had lowest unweighted price growth but LRIP FPIFs did better by spend

CPAF, CPFF, CS, O

Price growth

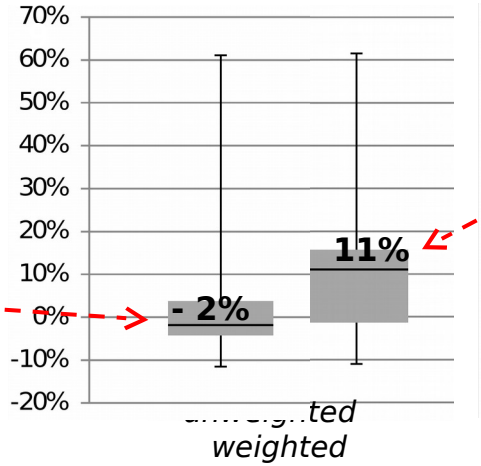
(*none*)

Lowest of all unweighted (just below formulaic LRIP at median)

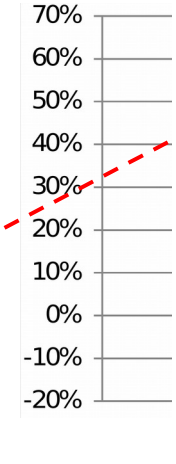
Final margin

(*none*)

FFP

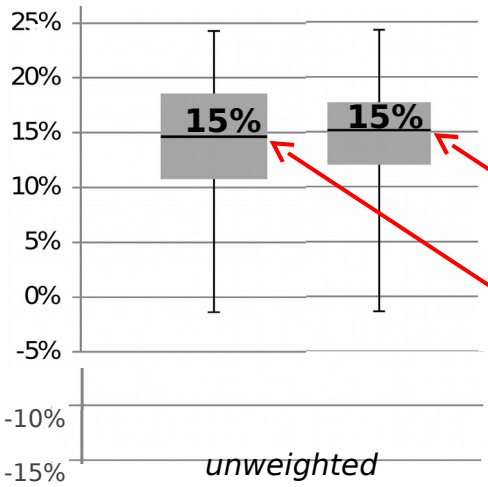


Formulaic Incentive



Formulaic LRIPs better than this at median when weighted

–1% **–1%**



Statistically significant

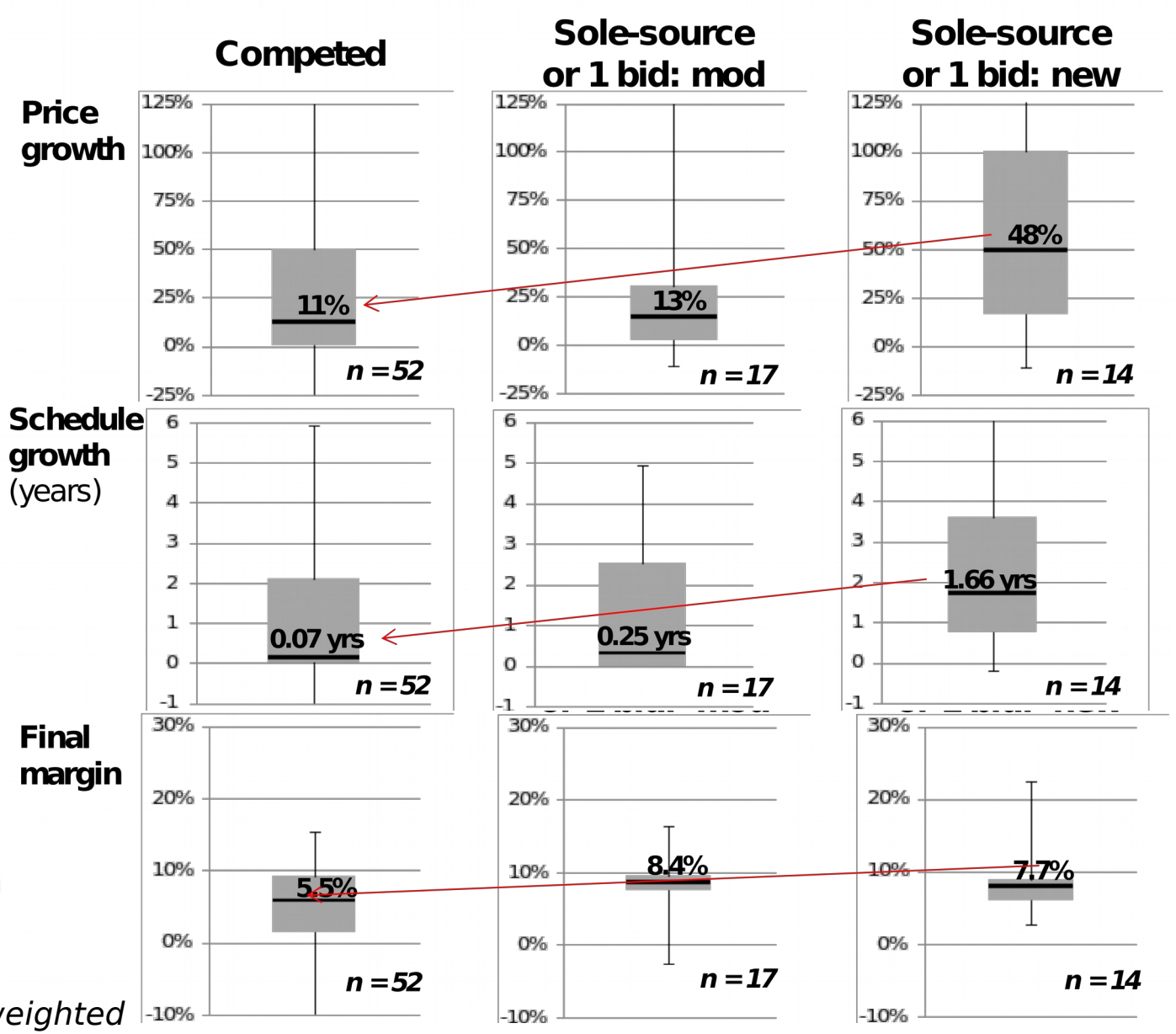
–12% **–11%**

Caution

Benefits of competition

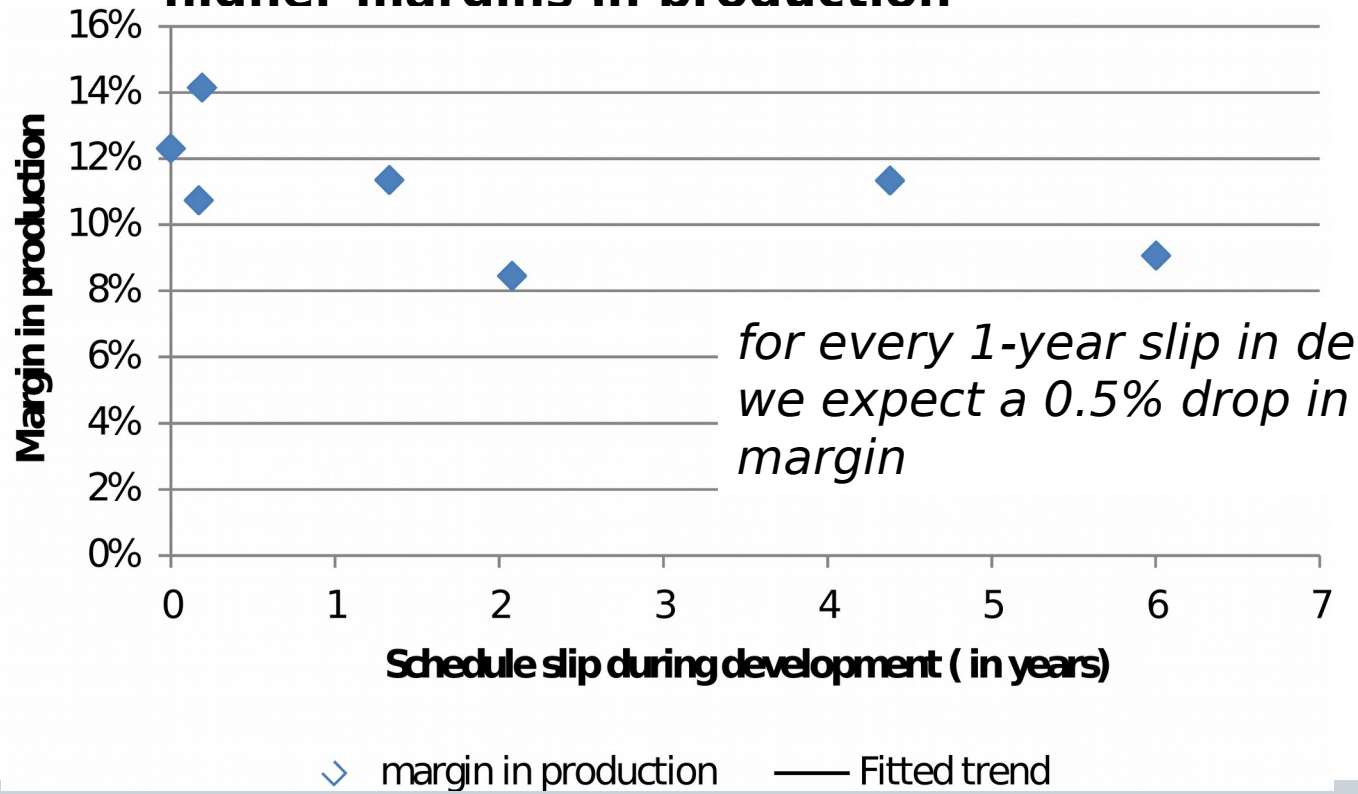
- **Striking benefits for competition on new systems**
  - **Price growth**
  - **Schedule growth**
- **Similar results for competition on system modifications/ upgrades**
- **Final margins were lower than all sole-sourced contracts**

unweighted



Effects of schedule slip in development on margin in production (on same program)

- **Program analysis suggests:**
  - **Higher margins in production incentivize contractors to get out of development faster**
    - **Shorter schedule slips in development are rewarded with higher margins in production**



Some Conclusions from the 2014 report

- **Not all incentives work. Contractual incentives are effective if**
  1. **We use them,**
  2. **They are significant, stable, and predictable, and**
  3. **They are tied directly to our objectives.**
- **"Cost-plus versus fixed-price" is a red herring**
- **CPIF and FPIF contracts perform well and share realized savings**
- **FFP contracting requires knowledge of actual costs**
- **Competition is effective—when viable**
- **Production margins may help minimize development time**

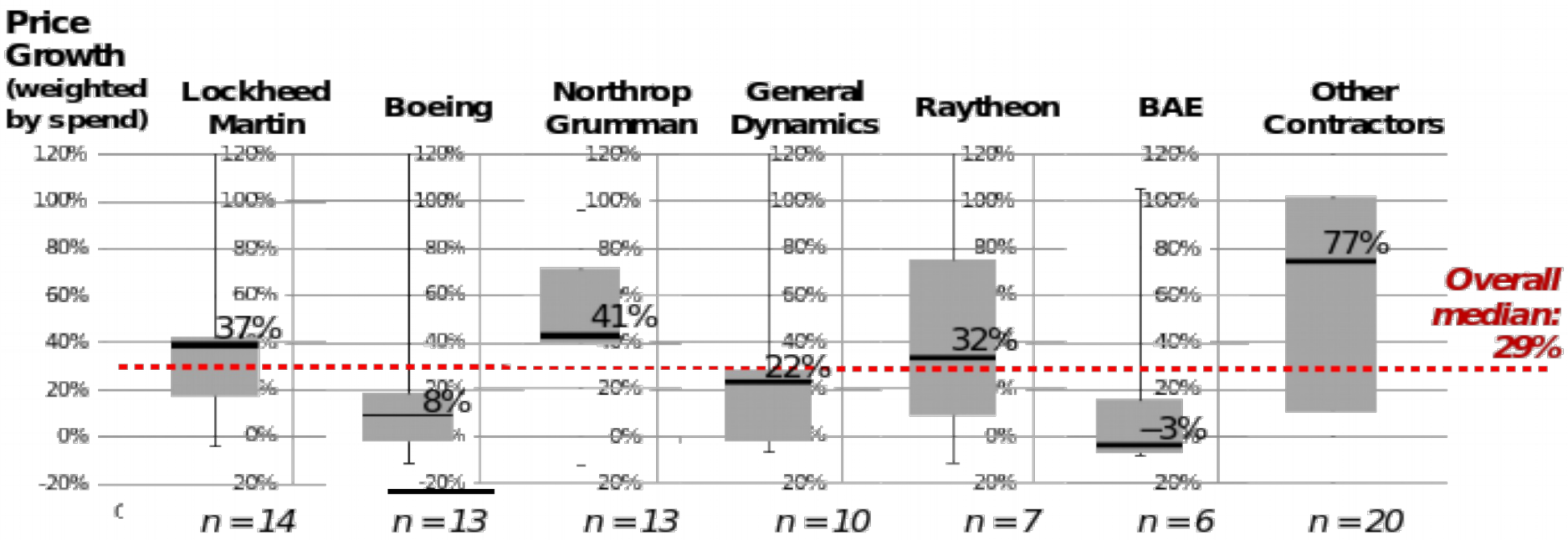
Inadequate incentives mean dissolution,
or changes of organization purpose,
or failure to cooperate.
Hence, in all sorts of organizations
the affording of adequate incentives
becomes the most definitely emphasized task
in their existence.
It is probably in this aspect of executive work
that failure is most pronounced.

Chester Barnard

The Functions of the Executive (1938)

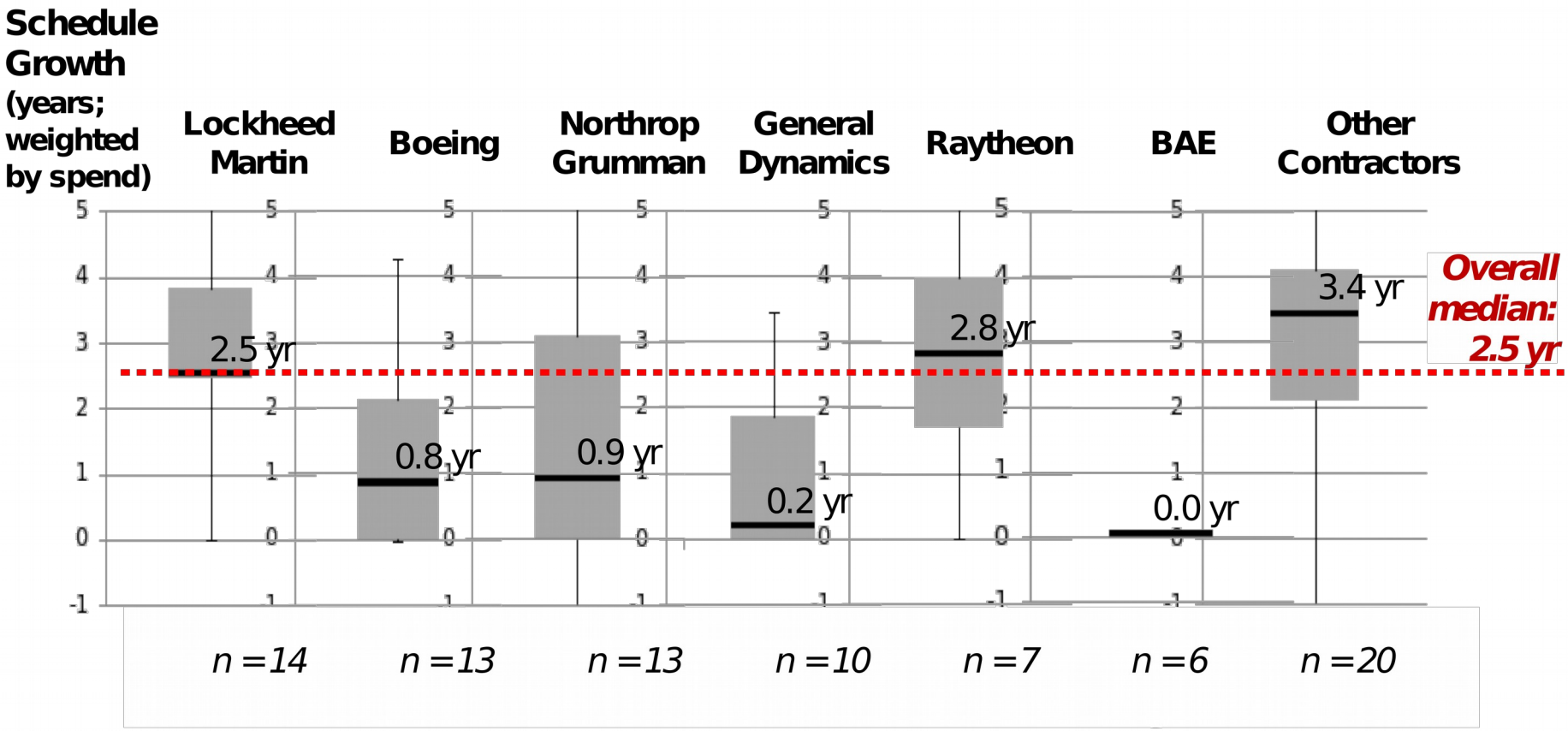
Backup slides

Price growth by Prime Contractor (*Development*)



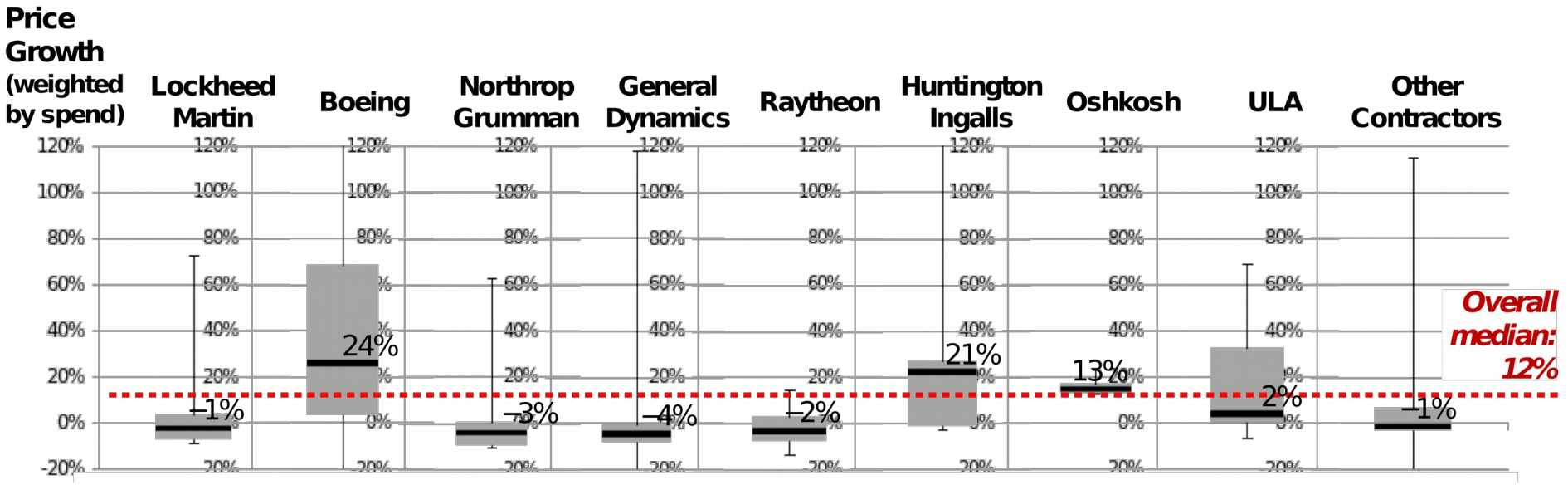
Weighted by spend

Schedule growth by Prime Contractor (*Development*)



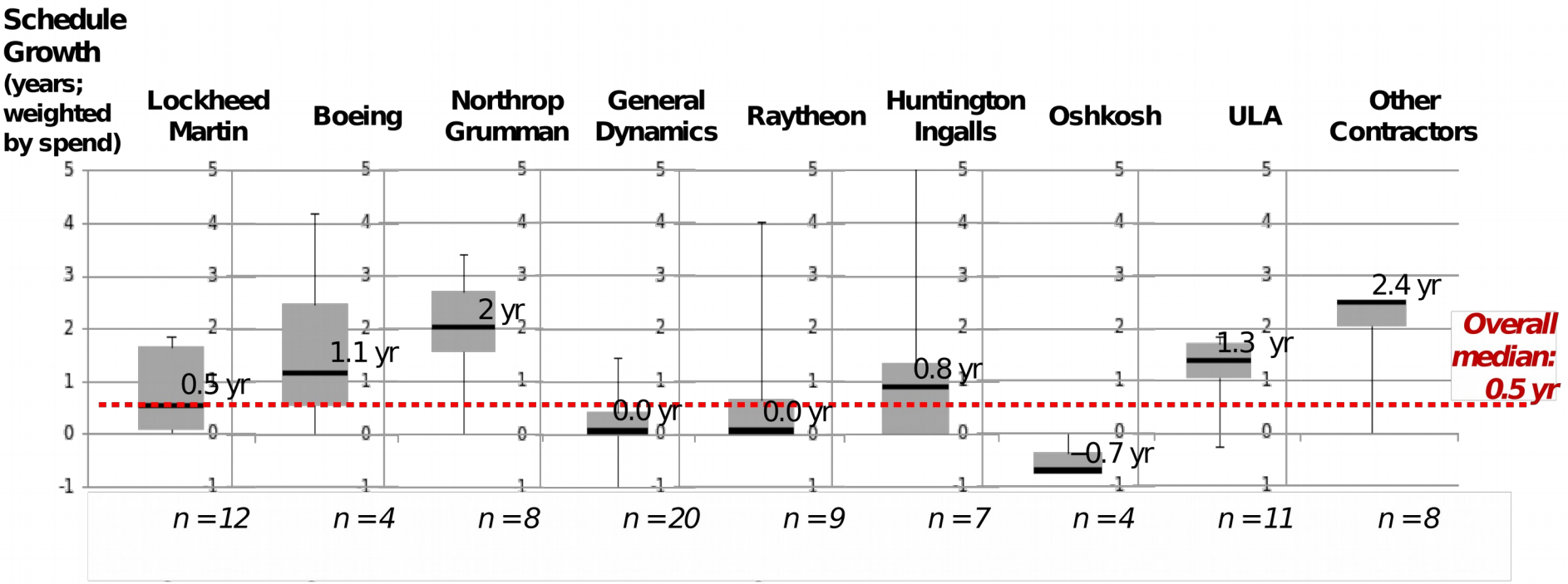
Weighted by spend

Price growth by Prime Contractor (*Production*)



Weighted by spend

Schedule growth by Prime Contractor (*Production*)



Weighted by spend

Operating Margins (SEC Filings)

Averages (percent)	2009	2010	2011	2012	2013
Defense	**9**	**9**	**9**	**9**	**9**
Commercial	*** 6**	**10**	**11**	**10**	**11**
Capital goods	*10*	*‡ 13*	*‡ 14*	*‡ 14*	*‡ 14*
Engineering services	** 5*	** 5*	** 6*	** 5*	** 6*
Automobiles and automotive parts	** –3*	** 7*	*8*	*6*	*7*
Defense					
Boeing *(BDS only)*	10	13	10	9	10
CACI	7	6	7	8	7
General Dynamics *(except Aerospace)*	11	11	12	8	8
Huntington Ingalls	3	4	2	5	7
ITT Defense/Exelis	12	11	8	11	10
L-3 Communications	11	11	11	10	10
Lockheed Martin	10	9	9	9	11
Mantech	9	8	8	7	6
Northrop Grumman	8	10	12	12	13
Raytheon	12	10	11	12	12

* Statistically lower than defense margins

‡ Statistically higher than defense margins

Commercial average is that for the 23–24 margins shown for all three sectors. SOURCE: Public SEC filings (Bloomberg, Capital Alpha Partners).

Operating Margins (SEC Filings)

Averages (percent)	2009	2010	2011	2012	2013
Capital goods					
Caterpillar	2	9	12	14	9
Cummins	6	12	15	11	12
Danaher	14	16	16	17	17
Dover	10	15	15	16	16
Eaton	4	9	10	9	12
Emerson Electric	13	15	16	18	17
Flowserve	14	14	14	14	15
Honeywell	13	14	15	11	16
Illinois Tool Works	10	15	15	17	18
Ingersoll-Rand	7	9	10	9	10
Joy Global	20	20	21	21	19
Lennox	4	6	4	7	9
Parker Hannifin	8	9	12	13	11
Rockwell Automation	8	13	15	16	17
Engineering services					
Aecom	4	5	5	4	5
CBI	7	8	8	8	7
Fluor	5	3	4	3	4
Jacobs Engineering	5	4	5	5	6
Automobiles and automotive parts					
Borg Warner	1	9	11	10	12
Delphi		7	10	10	11
Ford	–1	7	6	4	4
General Motors	–20	4	5	–2	5
Johnson Controls	1	5	5	4	4
TRW	4	9	8	8	7

“Other Contractors” category

2 contracts each:

- General Atomics
- Huntington Ingalls
- Bell Textron
- Sikorsky
- Rockwell Collins
- Alliant

1 contract each:

- General Electric
- Austral
- VT Halter Marine
- Computer Sciences Corporation
- ITT
- Tybrin Electronics
- SAIC
- VIASAT

In God we trust;
all others must bring data.

Attributed to W. Edward Deming

Approved for public release; distribution unlimited: 14-S-1935, 19 June 2014.